

EPRI RD&D3 Feeder Database User's Guide

(Utility 3)



Sandia National Laboratories



User's Guide Revision 1

September 19, 2013

This guide is to be used with the EPRI RD&D3 Distribution Feeder Database. The database is in csv format titled EPRI RD&D3 FEEDER DATABASE_Utility3Rev0.csv. This guide should be used a reference to assist the user in understanding the contents of the feeder database. As the database is updated this guide will be modified to an updated revision to reflect the changes in the database.

CONTENTS

1. Revision History	4
1.1. Revision 0	4
2. Description of Database	5
2.1. Definitions of Field Names	5
2.1. What's not in Database	8
3. Database Statistics	9
3.1. Histograms	9
3.2. Database Anomalies.....	16

FIGURES

Figure 1. Database Field Names	5
Figure 2. 3PH Length Distribution	9
Figure 3. 3PH Length Distribution (Greater than 20 miles)	10
Figure 4. Total Circuit Miles Distribution	11
Figure 5. Voltage Regulators Distribution.....	12

TABLES

Table 1. Database Maximums (Total 3-Phase, Total Circuit Miles, Peak Load)	15
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1. REVISION HISTORY

This section will be updated as the database and user's guide gets updated with newer revisions. Notes on the changes to this document and the user's guide will be made in the following sections.

1.1. Revision 0

Date: September 19, 2013

Notes:

- Initial Draft of Database User's Guide for Utility 3
- Paired to *EPRI RD&D3 FEEDER DATABASE_Utility3Rev0.csv*
- Database reflects the contents of a single California Distribution Utility
- 776 total feeders in database

2. DESCRIPTION OF DATABASE

This database was assembled from participating utilities at the request of EPRI and Sandia National Laboratories with an emphasis on certain key feeder properties to be provided. It is important to note that not all feeder properties of interest were extracted for each utility, which is why some field columns might be blank as this type of data is not currently available. Due to the differences among each participating utility in reporting feeder data each utility will have a separate database (.csv) and User's Guide (.doc) file.

	A	B	C	D	E	F	G
1	EPRI Feeder ID	EPRI Substation ID	Nominal voltage	Total 3-ph ckt miles	Total 3-ph OH ckt miles	Main 3-ph conductor	Total 2-ph and 1-ph ckt miles
2	1	37	12	4.34	0.07	300 AL 3ØCN UG	0.12
3	2	37	12	7.16	0.05	300 AL 3ØCN UG	0.35
4	3	37	12	6.64	0.00	300 AL 3ØCN UG	0.47
5	4	37	12	4.43	0.04	300 AL 3ØCN UG	0.57

← Field Names

Figure 1. Database Field Names

2.1. Definitions of Field Names

Feeder # – A number assigned to that particular feeder to identify it within the database. This ID has been generated by EPRI in order to protect the confidentiality of the distribution utilities circuits.

Substation – One or two letters assigned to the feeder to identify the particular substation it is fed from. This ID has been generated by EPRI in order to protect the confidentiality of the distribution utilities circuits.

Feeder Type and Topology

Nominal Voltage, kV – The kV in which the feeder is operated at. These values coincide with standard distribution operating levels and may have been consolidated to standardize the data, i.e. for instance feeders that list either 24.9kV or 25kV will be consolidated to a single value so as not to distinguish them from each other. For Utility 3, only 12 kV feeders were provided.

Total 3-ph ckt miles – Total length, in miles, of the feeder's 3-phase circuits (includes taps and laterals)

Total 3-ph OH ckt miles - Length, in miles, of the overhead portion of the feeder 3-phase circuits. *Note: Underground 3-Phase miles can be calculated by subtracting Overhead 3-Phase miles from Total 3-Phase miles.*

Main 3-ph conductor – The type of conductor of the feeder (e.g. 1/0, 336.4kcmil determined at the riser point from the substation getaway).

Total 2-ph and 1-ph ckt miles – Length, in miles, of the total single and two phase circuits off the feeder.

Total 2-ph and 1-ph OH – Length, in miles, of the overhead portion of the single and two phase circuits off the feeder. *Note: Underground 1&2 Phase miles can be calculated by subtracting Overhead 1&2 Phase miles from Total 1&2 Phase miles.*

Customer Data

Residential, % – Percentage of customers on feeder which consist of Residential Loads.

Commercial, % – Percentage of customers on feeder which consist of Commercial Loads.

Industrial, % – Percentage of customers on feeder which consist of Industrial Loads.

Device Data

Substation LTC – A Boolean value, ‘Yes’ or ‘No’ on whether the feeder substation has a Load Tap Changer.

LTC set points, target/total bandwidth - the total voltage range, one-half of which is allowed above, and one-half below the voltage level setting.

Number of line voltage regulators – The total number of line voltage regulators connected to the feeder. *Note: This does not include regulators that may be present at the substation (station LTC voltage regulators). (A regulator is a device used to maintain a constant voltage level on the circuit)*

Distance between Substation and voltage regulators – The distance, in miles, between the substation and the voltage regulator station.

Distance between voltage regulators – The distance, in miles, between regulator station and regulator station.

VR set points, target/total bandwidth – The target voltage for the voltage regulator as well as the permitted voltage range from the target voltage.

Number of switched/fixed capacitor banks – The total number of capacitor banks connected to the feeder. (*A device used to regulate voltage on the circuit through the addition of reactive power, VARs*)

Number of feeder tie points – A switch or termination point on the feeder that branches into two additional circuits.

Conservation voltage reduction feeder? – A Boolean, ‘Yes’ or ‘No’ on whether the feeder has the potential for Conservation Voltage Reduction (CVR).

Load Data

Connected service transformer capacity – The sum of the KVA rating for all service transformers tied to the feeder.

Feeder peak load, kW – The peak load on the feeder as measured at the substation in kW.

Feeder peak load month/time, mo./hr. – The date and time of day that the feeder peak load was measured.

Feeder minimum load, kW – The minimum load on the feeder estimated using the feeder peak load in kW.

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DG Data

Total amount of DG on circuit – The sum of the rated kW output for all DG on the feeder.

Does feeder contain utility-owned PV? – A Boolean, ‘Yes’ or ‘No’ on whether the feeder contains some PV owned by the utility.

Archived load data at feeder level – If load data is being collected at the feeder level, the data rate at which it is being recorded.

Archived load data at station level – If load data is being collected at the substation level, the data rate at which it is being recorded.

Solar irradiance monitoring or data? - A Boolean, 'Yes' or 'No' on whether there is any solar irradiance monitoring or data for the feeder.

2.1. What's not in Database

- Location Data – In order to protect the confidential nature of the utility's distribution system GPS coordinates and geographical data are not available in this database.
- The Following items were requested but due to the difficulty in obtaining for all feeders they are not currently present in the database.
 - Short Circuit Capacity at farthest 3-Phase node
 - Feeders with voltage class lower than 12KV
 - Approximate service area (sq mi)
 - % Agricultural
 - Total Customer Count
 - Commercial Customer Count
 - Domestic Customer Count
 - Industrial Customer Count
 - Other Customer Count

3. DATABASE STATISTICS

This section will give a brief statistical overview of the contents of the EPRI Feeder Database.

Summary:

Number of Feeders in Data – 776

Most common kV rating – 12kV

Average 3-Phase circuit miles: 11.6 mi

Average circuit miles (3P+1&2PH): 10.5 mi

3.1. Histograms

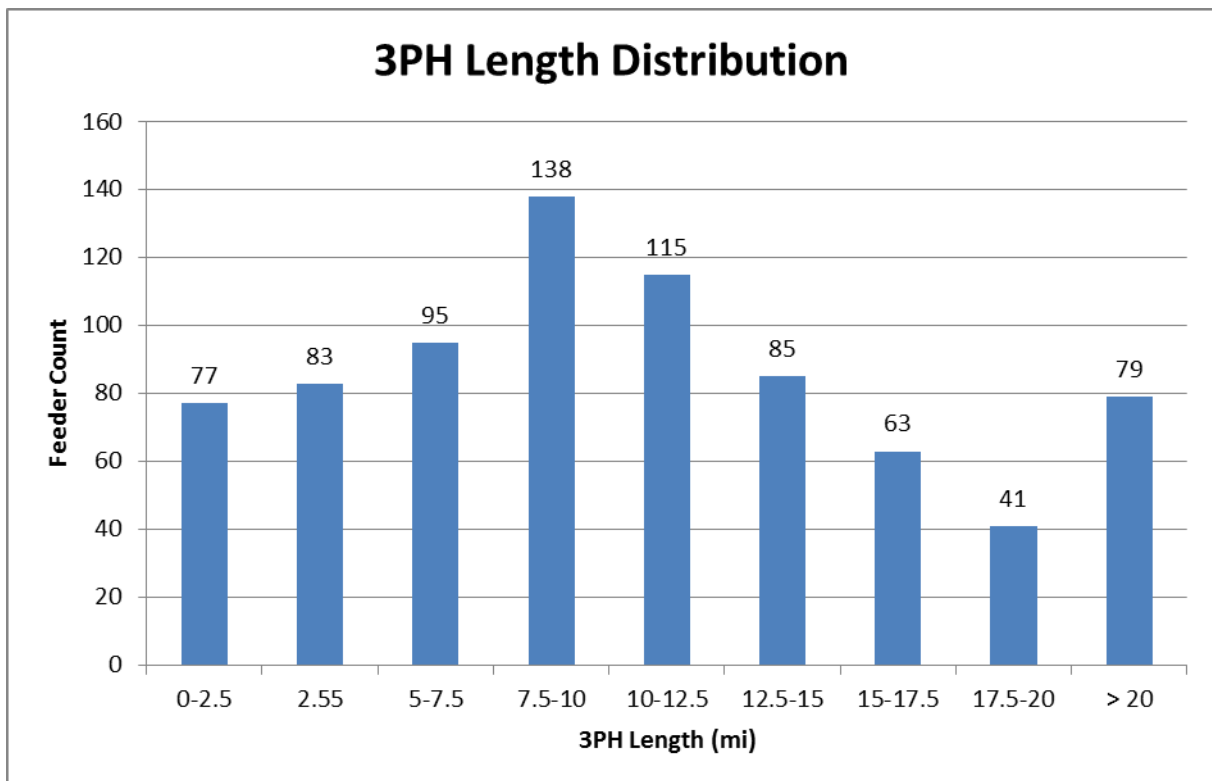


Figure 2. 3PH Length Distribution

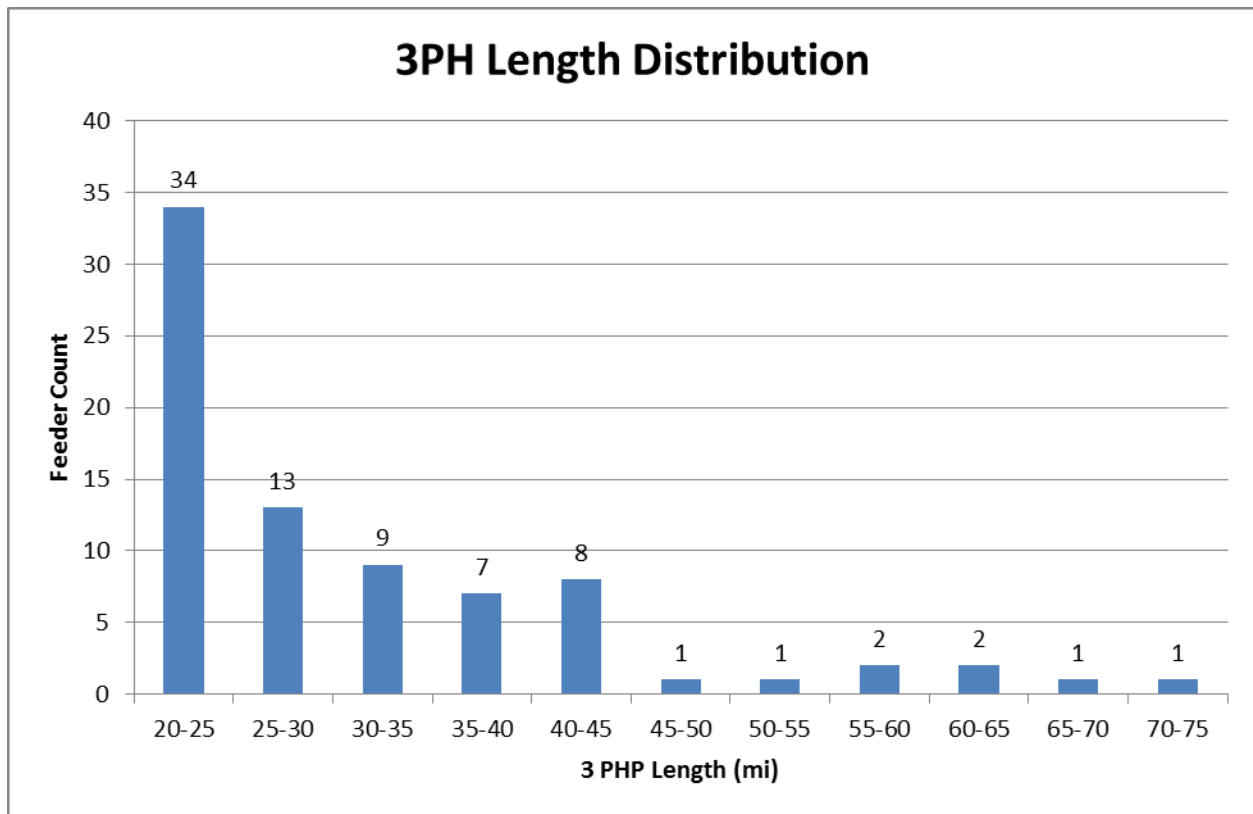


Figure 3. 3PH Length Distribution (Greater than 20 miles)

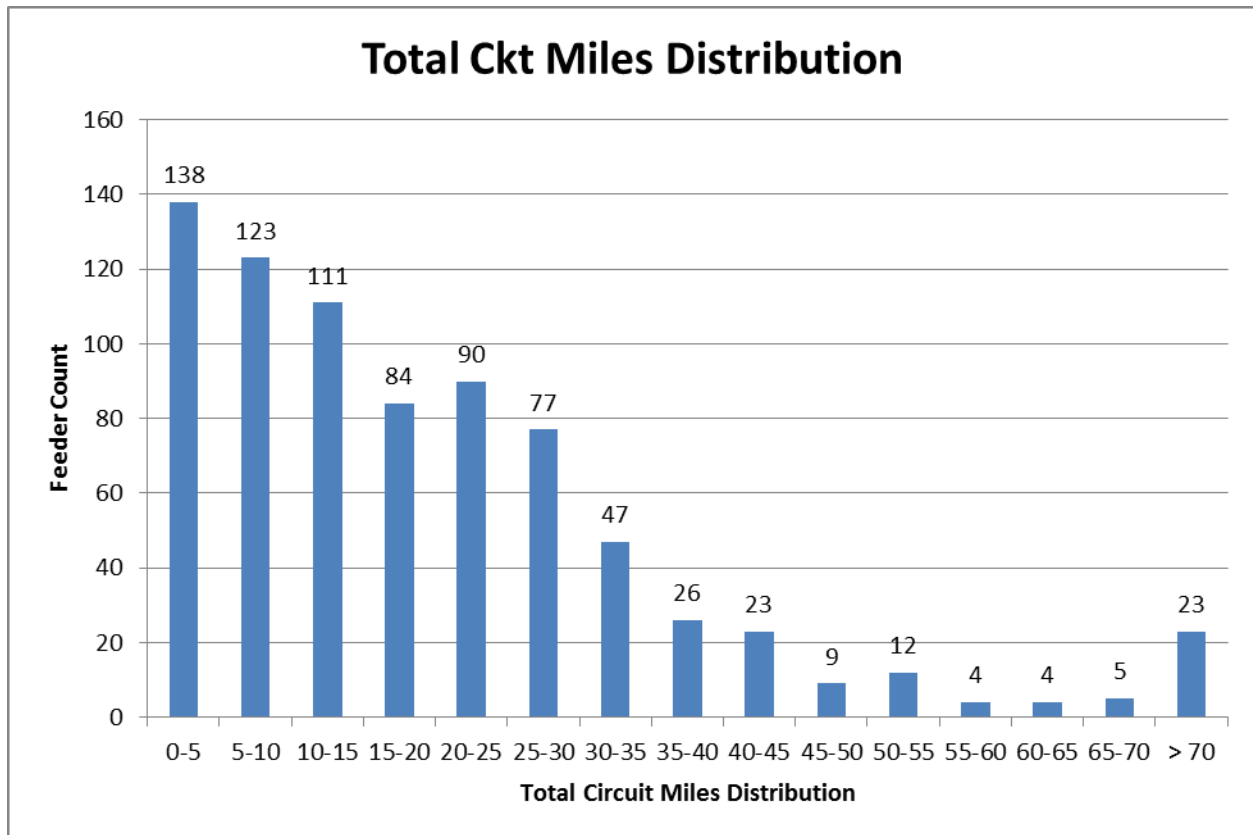


Figure 4. Total Circuit Miles Distribution

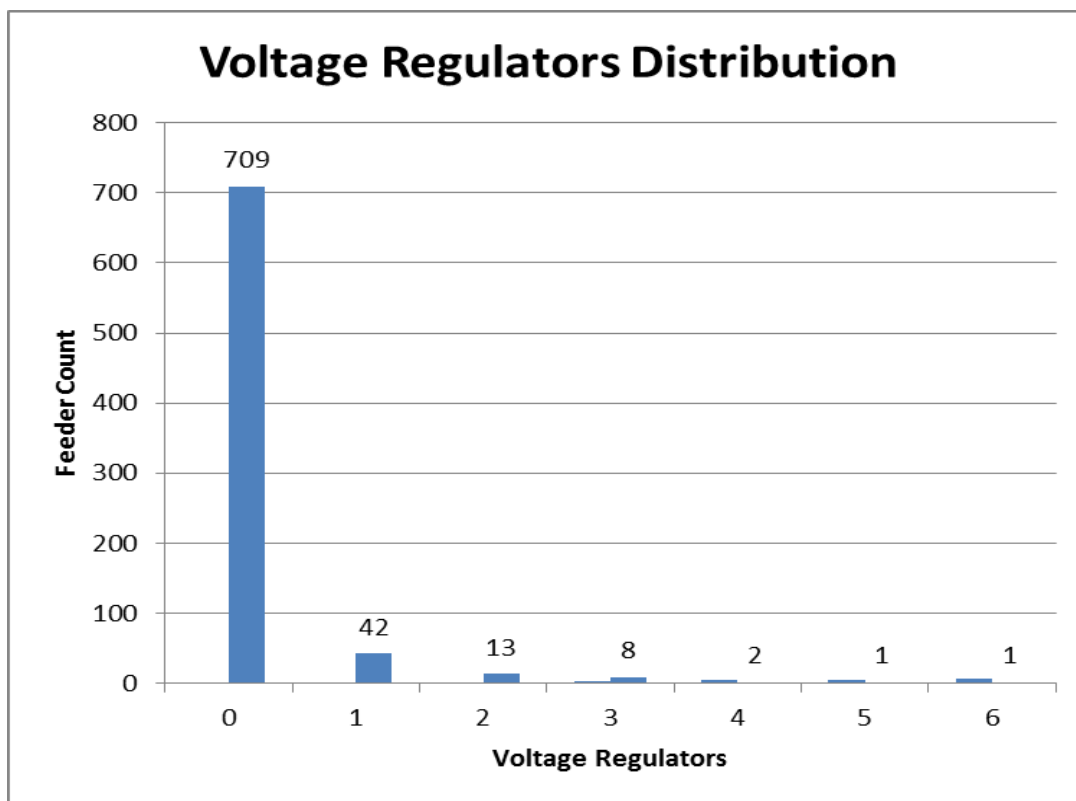


Figure 5. Voltage Regulators Distribution

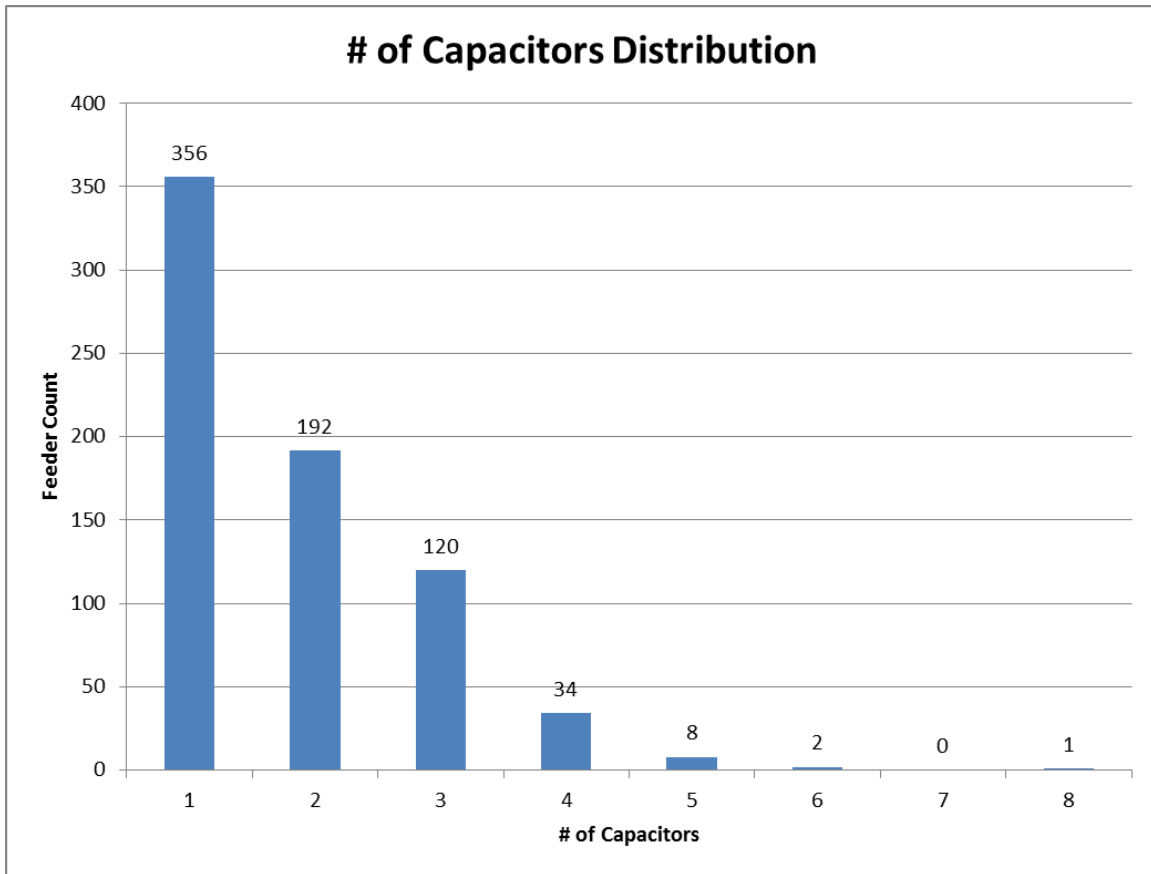


Figure 6. Capacitors Distribution

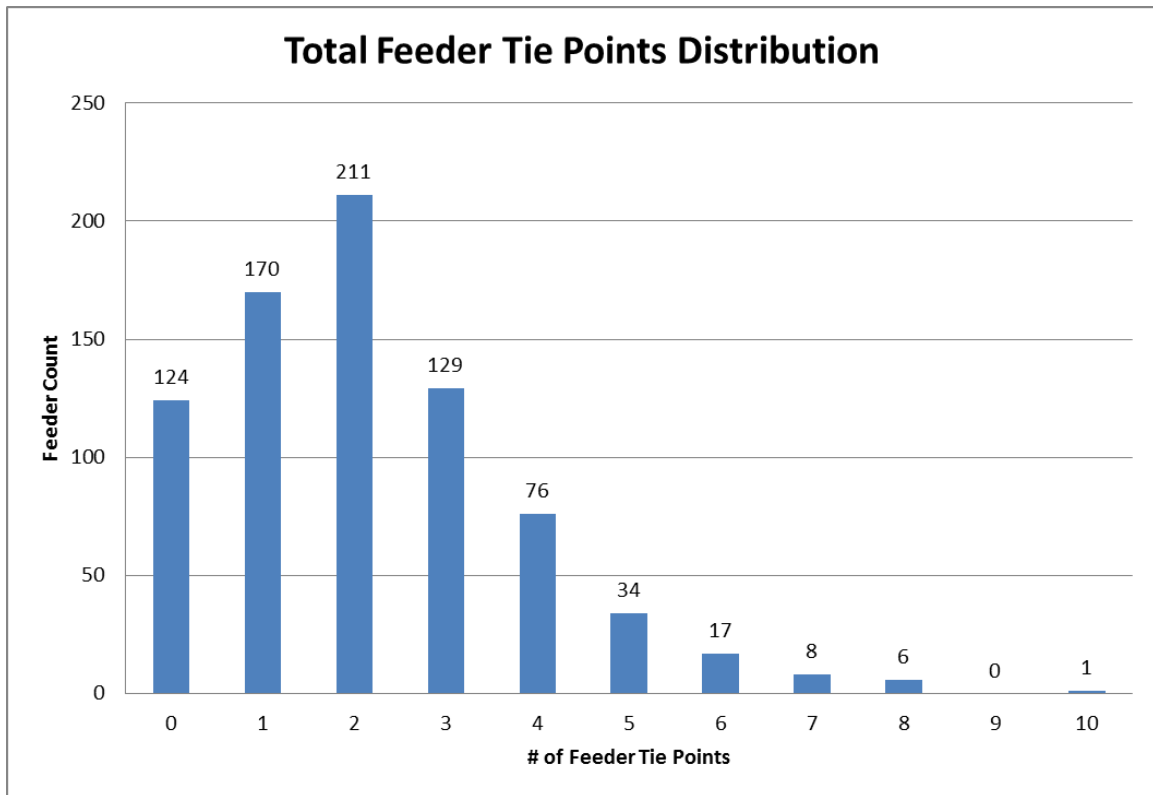


Figure 7. Feeder Tie Points Distribution

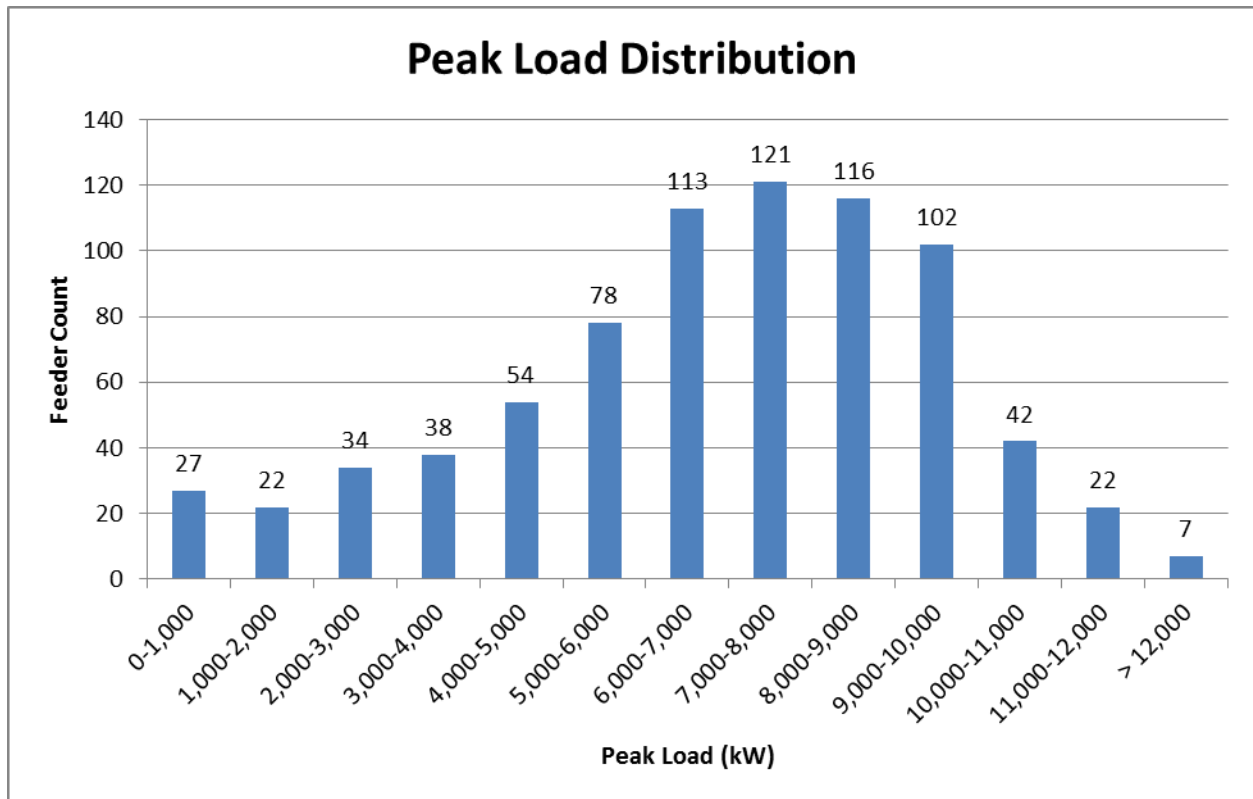


Figure 8. Feeder Peak Load Distribution

Table 1. Database Maximums (Total 3-Phase, Total Circuit Miles, Peak Load)

Max 3-Phase Length							
Feeder #	3-PH Length (mi)	1&2 PH Length (mi)	# Regulators	# Capacitors	# Tie Points	Peak Load (kW)	DG (kW)
212	73.81	43.17	3	3	0	3500	210.25
Max Total Ckt Miles							
Feeder #	3-PH Length (mi)	1&2 PH Length (mi)	# Regulators	# Capacitors	# Tie Points	Peak Load (kW)	DG (kW)
222	59.36	67.29	2	3	0	4610	251
Max Peak Load							
Feeder #	3-PH Length (mi)	1&2 PH Length (mi)	# Regulators	# Capacitors	# Tie Points	Peak Load (kW)	DG (kW)
1118	20.49	19.56	0	2	5	13340	578
Max Feeder Tie Points							
Feeder #	3-PH Length (mi)	1&2 PH Length (mi)	# Regulators	# Capacitors	# Tie Points	Peak Load (kW)	DG (kW)
1458	17.29	23.07	1	2	10	9000	325
Max # of Capacitors							
Feeder #	3-PH Length (mi)	1&2 PH Length (mi)	# Regulators	# Capacitors	# Tie Points	Peak Load (kW)	DG (kW)
200	42.5	37.46	0	8	8	6560	98

3.2. Database Anomalies

- 63 feeders listed a “Feeder peak load, (kW)” greater than the listed “Connected service transformer capacity, (kVA)”
- 1 feeder lists a “Feeder peak load, (kW)” but has “Residential (%)”, “Commercial (%)” and “Industrial (%)” all equal to zero
- 1 feeder with a voltage regulator listed, has no VR set point listed
- Lower voltage feeders (e.g. 4 KV class) were not provided by the utility